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ABSTRACT

This is one in a series of publications designed for parents and teachers to help children acquire developmentally appropriate basic educational skills at home and in school. Topics included are: (1) "What is math?" explaining mathematical concepts such as number, measurement, space, and time; (2) "How do children learn about math?"; (3) "Why is an understanding of math important?"; (4) "How you can help your children learn math?"; and (5) "Points to keep in mind." (YP)

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Getting Involved:
Your Child and Math

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Children are natural learners — each one unique, developing in his or her own way. Children learn at their own rate, and in many ways — by doing, playing, trying out, and initiating. They learn best when an activity is relaxed and a pleasant experience for them, their parents, and others in the family. The Getting Involved series is designed for parents, teachers, and other professionals in Head Start and the elementary schools. It provides ideas for helping children acquire developmentally appropriate basic educational skills at home and in school.

Head Start Bureau

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Basic Educational Skills Project

Getting Involved:

Your Child and Math

by

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A Head Start Initiative in Collaboration with Elementary Schools

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Four-year-old Maria is helping her mother plant a window box.

"Will we have lots of flowers, Mommy?" asks Maria.

"Yes, but they won't bloom for several weeks. When these plants have grown they will fill the whole window box."

Maria tells her, "I'll dig lots of holes for lots of flowers."

Her mother laughs. "Hold on! We'll only need one hole for each plant. Let's see. We have six plants. How many holes will you need to dig?"

"Six!"

"Right. Before you start, though, let's decide how we can place the plants evenly in the space we have."

Together she and Maria mark the places where Maria will dig. As her mother helps her place the plants in the soil, Maria counts each one.

The window box full of flowers will bring Maria and her family a lot of pleasure in a few weeks. Creating something beautiful isn't the only thing the four-year-old and her mother are doing as they work together. Maria is also learning about math. Her mother is giving her the opportunity to learn by giving her practice in:

- planning, estimating, and judging distance
- talking about the idea of time
- talking about the idea of space and area
- counting and matching

Children can learn about math in the things they do every day, and parents can help them learn. That is what this booklet is all about.

What is math?—

Children begin to learn about math long before they go to school. Even very young children think about and use math every day. We all do, whenever we deal with relationships among objects, events, and people in terms of "how many" or "how much." As young children interact and play with people and objects, they try to create order and explore the relationships within their world. In their activities, they encounter math concepts such as:

- number
- measurement
- space
- time

Children develop the concept of number through various play activities.

Number—

We use numbers to find the answer to the question, "How many?" Using numbers comes naturally to children. They love to count how many pennies they are holding, or how many people are sitting at the table. They might say, "One, two, four, seven," as they count out four things. Although this is not the way adults count, it is still good practice. Children who practice counting lots of things have an easier time learning about numbers.

Although we use numbers for counting, adding, subtracting, multiplying, and dividing, the concept of number is more than just the use of actual numbers. Young children's understanding of number develops as they:

- match (finding a pair of mittens or socks that go together, or giving each doll one pillow and one blanket)
- compare ("Who has more crayons, you or me?")
- sort or group (dividing raisins into several piles of different or identical amounts)
- order (lining up toy cars in order of size: "The first is big; the second is little.")

If children acquire these basic concepts, they will be better able to work comfortably with numbers later. Simple, everyday activities help children learn number concepts.

Measurement—

We use measurement whenever we want to know the answer to the question, "How much?" We measure such things as length, weight, temperature, and quantity. We usually find the answer by using some unit, such as inches for length, pounds for weight, degrees for temperature, and cups for quantity. Then we count up the total number of units. For example, when your six-year-old son asks, "How tall am I?" you use the unit of the "inch" or the "foot" to add up how many inches or feet tall he is. We use measurement all the time—we buy a pound of flour or say, "The house is a mile down the road."

Before children can understand these units as adults do, they need lots of experience estimating "how much." They may try to figure out how much material is needed to make a doll's dress, or how much play dough is needed to make an elephant. Children also estimate time: "I have time to do this puzzle before recess." As children develop and have many experiences, they learn to estimate more closely, to judge more accurately, and finally, to use units for measurement as adults do.

Playing with blocks can help children learn about measurement and space.

Space—

Children's understanding of space develops slowly. They use space quite naturally in their play activities. When children get a ball that has rolled under a chair, line up their toys on a shelf, or fit their shoes in a box, they are developing concepts of space. When they build with blocks, they are filling space with different sizes and shapes. When they run from one end of the yard to the other, they are learning how space is marked off by fences and buildings.

Young children's ideas about spatial relationships are very much based on 'how it looks to them.' A three-year-old who wants to surprise his mother might whisper, "Daddy, get behind me so Mommy can't see you." When they play hide-and-seek, preschoolers often think that covering up their faces will hide their whole bodies. ("If I can't see you, then you can't see me!") Parents must remember that this kind of thinking is natural and common for preschoolers. Older children think about spatial relationships much as adults do, which helps them do word problems in school.

Parents can help children understand space by giving clear and simple directions: "Your truck is between the bed and the chair." "Look for your ball inside the box." Parents can also help by giving simple descriptions to their children: "We live three blocks from the school." "Michelle's family lives in the apartment above us."

Time—

Time is a difficult concept. It takes children a period of years to understand time as adults do. They have to learn about such ideas as minute, hour, day, season, and year. They also have to understand notions like "a long time ago," "for three hours," "before," "after," "in a few minutes," and "tomorrow." Young children can best understand the idea of time when it is related to a particular event: "When I pick you up from school, it is five o'clock." "After supper we can work on cleaning the bike together." "After you go to bed one more night, Grandma will be here to visit." The notion of time can be difficult for children to grasp, because it involves measuring something that can't be seen or touched. It is also hard because it often means learning to wait.

Older children and adults depend on their more accurate ideas about time whenever they plan how many things they can do in a day or estimate how long it will take to get from one place to another. A concept of time is also necessary for understanding many science concepts.

Number, measurement, space, and time are important math concepts. As children learn about them, they are learning about the relationships among objects, and about their own relationship to objects and to the world around them.

Time is often a difficult concept for children to grasp.

How do children learn about math?—

Children of different ages understand math concepts in different ways. By watching their children at play, parents can recognize different stages of development in their children's thinking.

Very young infants do not know that an object still exists when they cannot see it. If their rattle is out of sight, it is also "out of mind." By the age of one year, most infants have learned that their rattle is somewhere, even when they are not playing with it. This understanding is necessary before children can begin to learn math concepts. Many two-year-olds have begun learning their first counting words, and they may know that three is more than one or two. But it will be a while before they understand larger numbers, such as the idea that nine is more than seven or eight.

Preschoolers' thinking is not always consistent or logical from an adult's point of view, since preschoolers are at the stage where their understanding of number, space, time, size, and other concepts depends on how something looks to them. Ten crackers spread out in a line may look to them like more crackers than the same number placed close together in a line. Young children often think that the spread-out row has "more to eat." After the age of five or six, most children can accept the idea that ten things are ten things, no matter how they are grouped or arranged in space. They have learned to separate the idea of number from the idea of length, and they tend not to confuse the two concepts.

Preschoolers' understanding of math concepts grows as they have lots of opportunities to play and learn. At first, a four-year-old might try to fit a little shoe on a big doll's foot and a big shoe on a little doll's foot. Older children know that the big shoe has to go with the big doll and the little shoe with the little doll. But the preschooler's way of thinking is an important step in learning what it means to measure. Later on, this kind of thinking becomes more precise and forms the basis for understanding more complex math concepts.

In elementary school, children still need opportunities to learn math concepts by using a variety of objects, like building with blocks, counting buttons, or weighing different things. Such experiences help them to understand basic math concepts and the meaning of abstract symbols (such as + and =).

All the steps that young children go through in thinking about "how many" or "how much" are important for their future math learning.

10 ***Before the age of five or six, most children can't separate the idea of number from the idea of length.***

Why is an understanding of math important?—

It is important for both children and adults to know how to find answers to such questions as "How many?" and "How much?" For young children, counting, matching, sorting, and ordering activities are challenging and satisfying. They help children to make sense of their world and to become confident about their own ideas. For older children, math plays an important role in science activities, such as figuring out how many days it takes for different plants to grow, or why the moon appears to have different shapes. Adults use math concepts every day for counting money, following a recipe, figuring out how to get from one place to another, and planning ahead.

Sorting is a challenging and satisfying activity for young children.

How you can help your children learn math—

You don't have to be a teacher to help your children learn math. Learning can come naturally, if you give your children plenty of chances to play with objects and ideas. This may take some time on your part. It isn't necessary to buy special materials: try to use what you have at home. Children will happily spend time mixing, sorting, and counting ordinary household objects, such as bottle caps or silverware. They also love to count the pennies you have left in your pocket. At the same time, they will be practicing math.

Don't worry about getting the "right" answer from your children. For example, if you ask your son to sort the forks and spoons, he may sort them according to size rather than shape: he might put all the small forks and small spoons together in one pile, and all the large forks and large spoons in another. To him, this is just as reasonable as putting all the forks together and all the spoons together. It shows that he can recognize how objects are the same and how they are different. The important thing is that he came up with the answer himself.

Your children may be learning math in school in a different way than you learned it. There is often more than one way to do a math problem and get the right answer. Tell your children this. You can also help by asking the teachers how to help your children with math: "I know that I learned to subtract one way. You are teaching my daughter a different way. How should I explain subtraction to her?"

Household objects are wonderful for learning math.

Make daily activities a learning experience—

Try to include your children in your household tasks—cooking, washing the car, sorting the laundry, or shopping. While they are helping, talk about what you are doing. You might say, "Get the biggest spoon," or "Will you find me two small onions?" While setting the table, you could ask a child to bring three cups or to put one spoon by each plate. Such activities help your children match and group those things that go together.

You can encourage younger children to do these math activities:

- count the stairs—up and down
- match objects as they dress—one mitten for each hand or one shoe for each foot
- put things away on shelves, in drawers, or in boxes (which helps them learn to group similar objects together)
- sort things in your sewing basket, tool box, or kitchen cabinet
- build with blocks or cartons to experiment with space and weight, balance and patterns
- play with measuring spoons and other objects, or make strings of beads (which will help them think about ordering)

- play with containers and cups of various sizes in the bathtub or sink. (If you think your children are old enough to play safely there, give them the go-ahead. You will be helping them learn about measuring.)

Older children often like these kinds of activities:

- running races over different distances
- simple card games like "Concentration" or "Go Fish" (which teaches them to match cards and to consider, "How can I get the one card that will help me make a pair?")
- cooking, which involves counting, measuring, and timing how long something should cook. (Cooking activities are good learning experiences for children, although you may need to supervise them. Some steps you may have to do yourself. Let your children watch you and encourage them to ask questions.)

Setting the table gets children thinking about math.

Talk with your children—

One of the best ways to help your children with math is to include math problems and concepts in your daily conversation with them. Comment aloud about:

- what is alike or different: "Look, there are three cats. Two are asleep and one is awake." "Sarah is seven. Is she older or younger than you?" "In our family there are more boys than girls, but in Pat's family there are the same number of boys and girls."
- how you will solve a problem: "How many people are going to eat? That's how many forks we need for supper." "How many inches of ribbon do I need to wrap this present? Let's measure." "We need to put away the groceries. I wonder if there's enough room on the shelf for these cans?"
- when things happen: "Erica is coming over to play after lunch." "It's two. I think I can get to the store and back before I pick up your sister at school at three."

With your older children, it might be fun to ask them to figure out how long the table is by using their hand as the unit of measure. Ask them how wide the room is, using their feet or toy truck to measure it.

Talking with your children gives them a chance to think about "how much" and "how many." It allows them to express their ideas and to ask questions that develop their curiosity and increase their understanding. As you talk with them, you are teaching them about math concepts and why they are useful.

By sharing daily activities and explaining what they know about the world, parents can encourage their children to make sense out of their experiences. And by watching their children participate in activities, parents can observe how they are growing and learning, and can build upon the understanding their children have acquired.

Encourage your children to think about concepts such as "how many" and "how much."

Points to keep in mind—

- Math has to do with the relationships among objects, events, and people in terms of "how many" or "how much." Young children explore these relationships by dealing with number, measurement, space, and time.
- Children develop math concepts gradually and naturally through experience.
- Children need to have many experiences with concrete objects, even in elementary school, before they can understand math concepts in an abstract way.
- Math concepts are used every day. Understanding math concepts helps people function in the world.
- You can help your children learn math. Relate math to everyday activities and talk with them about the basic ideas of math.

Parents play an important role in helping their children develop math concepts.

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Other books in this series are:

Your Child and Language
Your Child and Play
Your Child and Problem Solving
Your Child and Reading
Your Child and Science
Your Child and TV
Your Child and Writing
Your Child's Attitudes Toward Learning

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